Patent Claims (Original)

1. A device for actuating an articulated mast (22) pivotally linked to a mast base (21) that is rotatable about a preferably vertical axis (13) on a chassis (11), the articulated mast comprising at least three mast arms (23 to 27) limitedly pivotable, about respectively parallel horizontal articulation axis (28 to 32), relative to the mast base (21) or an adjacent mast arm (23 to 27), via a respective drive unit (34 to 38), including a control unit (microcontroller 70) for actuating the drive units (34 to 38) for the mast movement, the control unit including a coordinate transformer (74, 76) which responds to guiding parameters (*r, h*) preferably provided in a chassis-referenced coordinate system and to measured angular values (ε_v) that are determined by means of angle sensors (44 to 48) located on the mast arms (23 to 27) for translation into articulation axis referenced movement signals ($\Delta\alpha_v$) for the drive units (34 to 38) in accordance with predefined path/slew characteristics, thereby characterized, that geodetic angle sensors (44 to 48) which determine geographically referenced angular values (ε_v) of the individual mast arms (23 to 27) are disposed in a rigid manner on the mast arms (23 to 27).

2. Device according to Claim 1, thereby characterized, that in addition a geodetic angle sensor (49) is provided on the mast base (21) for measurement of a geographically referenced angle value associated with the mast base (21).

3. Device according to Claim 1 or 2, thereby characterized, that at least one geodetic angle sensor is provided on the chassis

(11) for measurement of at least one geographically referenced angle value associated with the chassis.

4. Device according to one of Claims 1 through 3, thereby characterized, that the geodetic angle sensors (44 through 48) are tilt angle sensors responsive to the gravity of the earth.

5. Device according to one of Claims 1 through 4, thereby characterized, that the coordinate transformer includes a software routine (76) for conversion of geographically referenced mast arm base angle values (ε_v) into articulation angles (α_{iv}).

6. Device according to one of Claims 1 through 5, thereby characterized, that the coordinate transformer includes a software routine (74) for conversion of the guide or command value (r) into guide articulation angles (α_{sv}) in accordance with a predetermined path/slew characteristic of the articulated mast (22).

7. Device according to one of Claims 1 through 6, characterized by a software routine (78) responsive to dynamic angle measurement values (α_{iv}) for the dividing thereof into low frequency and high frequency angle measurement value components.

8. Device according to Claim 6 or 7, characterized by a group of articulation axes referenced control comparers (90), which are acted upon by the stationary or low frequency component (α_{iv}^N) of the articulation axes based articulation angles (α_{iv}) as instantaneous values and the articulation axes based

guide articulation angles (α_{iv}) as set or desired values, and which are connected on the output side with an articulation axes based command or steering value controller (84) for control or actuation of the drive units (34 through 38) of the associated articulation axes (28 through 32).

9. Device according to Claim 7 or 8, characterized by a group of articulation axes based or referenced error value controllers (86), which are acted upon with the articulation axes high frequency component (α_v^H) of the articulation angle and which are connected to the signal inputs (88) of the associated drive units (34 through 38) of the articulation axes (28 through 32) with formation of an error magnitude input circuit.

10. Device according to Claim 9, thereby characterized, that the error magnitude controllers (86) are preceded by a software routine (80) responsive to the geographically referenced angle measurement values (ε_V) and the high frequency summed component (αH) of the articulation angles for determining the articulation axes based high frequency component (α_v^H) of the articulation angles.

11. A device for actuating an articulated mast (22) pivotally linked to a mast base (21) that is rotatable about a preferably vertical axis (13) on a chassis (11), the articulated mast comprising at least three mast arms (23 to 27) limitedly pivotable, about respectively parallel horizontal articulation axis (28 to 32), relative to the mast base (21) or an adjacent mast arm (23 to 27), via a respective drive unit (34 to 38), including a control unit (microcontroller 70) for actuating the drive units (34 to 38)

for the mast movement, the control unit including a coordinate transformer (74, 76) which responds to guiding parameters (*r, h*) preferably provided in a chassis-referenced coordinate system and to measured angular values (ε_γ) that are determined by means of angle sensors (44 to 48) located on the mast arms (23 to 27) for translation into articulation axis referenced movement signals ($\Delta\alpha_v$) for the drive units (34 to 38) in accordance with predefined path/slew characteristics, thereby characterized, that respectively one GPS-module is rigidly provided on each mast arm for determining the geographically referenced position measurement value of the individual mast arms, wherein the coordinate transformer is acted upon by the position measurement values of the GPS module.

12. Device according to Claim 11, thereby characterized, that in addition a GPS module is associated with the mast base for measurement of a geographically referenced position measurement value associated with the mast base.

13. Device according to Claim 11 or 12, thereby characterized, that in addition at least one GPS module is provided associated with the chassis for measurement of at least one chassis associated geographically referenced position measurement value.

14. Device according to one of Claims 11 through 13, thereby characterized, that the coordinate transformer includes a software routine (74) for conversion of geographically referenced mast arm based position measurement values into articulation angles (α_{iv}).

15. Device according to one of Claims 11 through 14, thereby characterized, that the coordinate transformer includes a software routine for conversion of command values (r) into command articulation angles (α_{sv}) in accordance with a predetermined path/slew characteristic of the articulated mast (22).

16. Device according to one of Claims 11 through 15, characterized by a software routine (78) responsive to the dynamic position measurement values, for their distribution or subdivision into low frequency and high frequency position measurement components.

17. Device according to Claim 15 or 16, characterized by a group of articulation axes based control comparers (90), which can be acted upon with the stationary or low frequency components (α_{iv}^{N}) of the articulation angle (α_{iv}) as instantaneous values and the command angles (α_{sv}) as desired or set values and which, on the output side, are connected with respectively one articulation axes based command value controller (84) for actuating the drive units of the associated articulation axes (28 through 32).

18. Device according to Claim 16 or 17, characterized by a group of articulation axes associated error value controllers (86), which can be acted upon with the articulation axes based high frequency components (α_{v}^{H}) of the articulation angles and which are connected to the signal inputs (88) of the associated drive units (34 through 38) of the articulation axes (28 through 32) with formation of an error magnitude circuit input.

19. Device according to Claim 18, thereby characterized, that the error value controllers (86) are preceded with a software routine (80), responsive to the geographically referenced position measurement values and the high frequency component (α^H) of the articulation angle, for determining the articulation axes based high frequency component (α_v^H) of the articulation angle.